



# OPTIMIZING SOLUTION PLATFORMS IN THE AVIATION INDUSTRY

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3.5" SUBCOMPACT BOARD WITH INTEL<sup>®</sup> 6TH GENERATION  
U CORE™ I7/I5/I3/CELERON<sup>®</sup> PROCESSOR SOC



BY VIVIEN WANG

**OVER** the past decade or so, the deployment of embedded single boards in airborne operations has expanded from being an obscure market niche to a veritable sector that encompasses a vast range of industrial business lines. The overall market trend of fitting more functions into smaller, more compact units with higher flexibility has permeated the aircraft supply industry and is here to stay for good. A number of macro-scale deployment efforts by major airlines all around the world are already underway, and the market for embedded single boards in commercial aircraft is rapidly evolving.

In the broader market, Deloitte predicts strong growth in the global aerospace and aviation industry for 2017 due to lower oil prices and higher passenger travel demands, as well as an accelerated equipment replacement cycle. In the wider context of aerospace engineering per se, increasing global tensions are leading to an influx of worldwide government expenditure on defense and military, especially for countries in the regions such as the Middle East, the Far East, Eastern Europe and the United States.

## CHALLENGES

Creating an optimized platform for the integration of I/O, BIO, memory support, mSATA and display support, among other features, is a daunting challenge, which requires highly specialized training and aptitude in embedded computing, interface design and hardware engineering for commercial aircraft architecture.

Our client, a major Asian manufacturer of commercial aircraft, wished to integrate embedded boards into a scalable, easily maintainable and efficient platform to consolidate their cockpit panels. The deployment of single compact boards were constrained by very specific physical demands unique to the aviation industry such as environmental and dimensional limitations, as there is a threshold for the size, scale and weight of each airborne application that must not be exceeded under any circumstances. In addition, connectivity, configuration and interoperability imperatives had to be adhered to and strictly observed, as the single embedded board had to operate at maximum efficiency and facilitate speedy, seamless interaction between the avionics within the architecture.

THE OVERALL MARKET TREND OF FITTING MORE FUNCTIONS INTO SMALLER, MORE COMPACT UNITS WITH HIGHER FLEXIBILITY HAS PERMEATED THE AIRCRAFT SUPPLY INDUSTRY AND IS HERE TO STAY FOR GOOD.

Balancing the dynamics between expenditure, dimensions, flexibility and scalability, therefore, was another major challenge. As with any large-scale system, the consolidation of disparate systems and distinctive networks into a unified,

coherent and accessible platform is the ultimate goal in framework and architecture design. With this in mind, a single board must be fully interoperable and provide maximum reliability and system integration within every scenario, in order to achieve broad-based success that is sustainable over the long run.

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## SOLUTIONS

AAEON's engineers came up with the GENE-SKU6, a subcompact board roughly the size of a hard disk drive that is powered by the Intel® Core™ i7/i5/i3/Celeron® 6<sup>th</sup> Generation Core Processor SoC. A working sample was provided for the client to test in the first stages of the collaboration, enabling the minimization of research and development costs for the client. Once a dry run had been successfully completed, the units were deployed.

THE AAEON GENE-SKU6 IS IDEALLY SUITED FOR LONG-TERM DEPLOYMENTS IN DEMANDING AIRBORNE ENVIRONMENTS, REQUIRING MINIMUM MAINTENANCE.

The GENE-SKU6 delivers enhanced performance over its preceding models in the series with the latest integrated chipset, and offers a DDR4 memory capacity of up of 16 GB. Native support is also offered for popular expansion interfaces and I/Os such as MiniCards and mSATA, along with AAEON's unique BIO interface, which is specially designed to accommodate easily accessible and speedy customization, therefore making it ideally suited for avionic embedded computing applications. PoE (Power over Ethernet) support is also available for optional expansion.



This feature provides connection to devices, such as wireless access points or IP cameras, and minimizes the fuss of traditional deployments with long power lines or limitations caused by a shortage of power outlets. This facilitates swift prototyping and a high degree of customization down to granular requirements.

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## EFFECTIVE THERMAL AND AIR FLOW MANAGEMENT WHERE THE AIR IS THINNER

Heftily designed for low-power consumption and high-efficiency output in confined environments, the GENE-SKU6 boasts a unique layout with the CPU (i7-6600U) located on the solder side of the board, which is consolidated by a heat spreader that enables quiet, fanless heat dissipation and vertical space reduction. This scale of durability ensures the AAEON GENE-SKU6 is ideally suited for long-term deployments in demanding airborne environments, requiring minimum maintenance.

THE FLEXIBLE EXPANSION INTERFACE OF THE I/O FACILITATES A REMARKABLE DEGREE OF EXPANDABLE SERVICEABILITY

Additionally, the GENE-SKU6 is designed for the rugged environmental extremes of the cockpit, with an operational temperature range of 32°F ~ 140°F (0°C ~ 60°C).

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### INTERSECTING DIFFERENT CONFIGURATIONS

Compact, smart, secure, and able to consolidate a wide range of different sensors and devices upon a unified platform, AAEON's GENE-SKU6 solution was ideally suited for this kind of vertical integration in cockpit panel architecture, made possible by meticulous platform design and configuration management.

“THE ADVANTAGE IN FASTER THROUGHPUT AND IMMEDIATE DEVELOPMENT AND RESPONSE TIME WAS SUBSTANTIAL TO OUR SUCCESS IN DELIVERING TO THE CLIENT IN THIS CONTEXT.”

– JULIE HUANG, PRODUCT MANAGER, EMBEDDED COMPUTING DIVISION

Other environmental constraints were also mitigated as AAEON optimized the single board to allow for quick access, providing optimal coverage and maximum connectivity. AAEON's GENE-SKU6 is highly customizable from reference architecture to ensure interoperability between systems for ease of deployment, and underpins a massive network of solution providers across the board.

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### OPTIMIZED IMAGING AND DISPLAY SUPPORT

The AAEON GENE-SKU6 features a 3.5" single-board computer designed around Intel® Core™ i7/i5/i3/Celeron® Processor SoC, which provides high resolution graphics for

superior visual computing in an airborne enclosure. DVI-I, CRT/DP and LVDS support is provided for video output, along with a backlight inverter supply that is mandatory in most AAEON models. Additionally, the flexible expansion interface of the I/O facilitates a remarkable degree of expandable serviceability.

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### IMMEDIATE AND HANDS-ON TECHNICAL SUPPORT

Time zones and the ability to provide immediate troubleshooting and support were also mitigating factors in selecting AAEON as the supplier, as AAEON is headquartered in Taipei and was able to provide swift technical assistance and support immediately to the Asian-based client, coordinating with AAEON's dedicated local engineering services & supplies team to render real-time troubleshooting and co-opt risk management.



“The advantage in faster throughput and immediate development and response time was substantial to our success in delivering to the client in this context,” explains Julie Huang, Product Manager for AAEON's Embedded Computing Division (ECD). “Making sure that our systems are seamlessly integrated into existing infrastructure to provide maximum output is a top priority and a very important link in the service we provide our customers, and real-time response and troubleshooting was able to result in successful solution deployment.”

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## IMPACT

In selecting suitable frameworks and partnerships with service vendors, aircraft suppliers can meet the aforementioned challenges head-on and optimize their operations and R&D manufacturing lines accordingly. Many aircraft conglomerates are already taking steps to consolidate their own systems with single board embedded computers, as there is truly more than meets the eye when it comes to these diminutive but multifunctional and highly efficient powerhouses.

AAEON'S GENE-SKU6 IS HIGHLY CUSTOMIZABLE FROM REFERENCE ARCHITECTURE TO ENSURE INTEROPERABILITY BETWEEN SYSTEMS FOR EASE OF DEPLOYMENT.

Compact single boards intersect size, weight, efficiency and costs, firmly consolidating their role as essential building blocks in the next step for innovative and smart aviation engineering.

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## REFERENCES

Deloitte. (2017). *Global Aerospace & Defense Outlook 2017* | Deloitte | C&IP. [online] Available at: <https://www2.deloitte.com/global/en/pages/manufacturing/articles/global-a-and-d-outlook.html#> [Accessed 5 Jul. 2017].

## ABOUT AAEON

Established in 1992, AAEON is one of the leading designers and manufacturers of professional intelligent IoT solutions. Committed to innovative engineering, AAEON provides reliable and high quality computing platforms, including industrial motherboards and systems, industrial displays, rugged tablets, embedded controllers, network appliances and related accessories, as well as integrated solutions. AAEON also has the hardware and services for premier OEM/ODMs and system integrators, worldwide. Being an Associate Member of the Intel® Internet of Things Solutions Alliance, AAEON offers customized end-to-end services from the initial product conceptualization and board product development to mass manufacturing and after-sales service programs. AAEON is also a GSA government contract holder (#GS-35F-0470Y) serving Federal, State & Local government sectors. Peruse AAEON's expansive line of products and services by visiting [www.aaeon.com](http://www.aaeon.com).